Guest Editorial

INTERVENTIONS: ADVANCING THE STATE OF THE ART

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In 1996, the National Institute for Occupational Safety and Health (NIOSH) published its first National Occupational Research Agenda (NORA).[1,2] Intervention effectiveness was one of the 21 priority research areas identified in this agenda. A review of 43 studies published between 1988 and 1994 found that occupational health and safety intervention effectiveness research was still in its infancy. Most studies described the effectiveness of a single type of intervention, focused on engineering controls and employee education, involved relatively small numbers of people, and used nonexperimental designs.[3]

While we made no rigorous effort to count or review all occupational health and safety intervention studies since the 1990s, a quick search of the PubMed database suggests that research in this area is on the rise. Perhaps more importantly, there appears to be growth in best-practice reviews, especially in the areas of occupational injuries, effectiveness of personal protective equipment, methods for preventing workplace stress, and a variety of ergonomic approaches. The identification of best practices is the first step toward long-term improvements in workplace safety and health.

The NORA Intervention Effectiveness Research Team proposed a three-phase conceptual model for occupational health and safety intervention research. Developmental research is first needed to ensure a clear understanding of the target population and to design intervention methods tailored to the needs of this population. Implementation research next examines the methods by which interventions are best delivered and applied by members of the target population. Only then is it possible to design and conduct experimental studies that measure the effectiveness of interventions in the "real world."[4]

Occupational health and safety researchers face considerable challenges when undertaking intervention research. In the development phase, surveillance data are often missing, of poor quality, or fail to address important outcomes. In many instances, members of the target population are dispersed, isolated, difficult to reach, and lack an organized voice, making their needs and perspectives difficult to assess. Community partners are not always readily available and are often unfamiliar with important aspects of the target population. Theories may not be applicable or easily adaptable to workplace settings. Outcome measures can be particularly challenging to design, because lagging indicators such as injuries are underreported and occur infrequently. Data are limited regarding which leading indicators (e.g., the presence of certain measures or programs) are most directly correlated with improvements in injury or illness rates.

This *Public Health Reports* supplement contains research and practice articles addressing the design, implementation, and effectiveness of health and safety interventions in a broad range of workplace settings. The articles included in this supplement resulted from a call for papers that advance the applied scientific knowledge on occupational health and safety interventions. Manuscripts could be analytical or descriptive and could address implications for practice, policy analysis, innovative partnerships, intervention comparisons and evaluations, and training case studies. Specific areas of interest included:

- Special populations (e.g., children, non-English-speaking populations, small businesses)
- Prevention through design
- Integration of hierarchy of controls
- Use of behavioral-based models
- Application of study and intervention design models
- Innovative outcome measures and evaluation methods
- Intervention dissemination

This supplement includes 19 articles describing the results of practice- or research-based evaluation, implementation, or effectiveness studies in a broad range of workplaces. Many address efforts to reach nontraditional, hard-to-access populations—workers in small businesses, Hispanic workers, construction trade employees, homecare workers, and farmers and agricultural workers.

Investigators in the practice area describe methods for involving communities and building partnerships with a broad range of stakeholders. Some describe new models or approaches for designing intervention studies (e.g., Helitzer et al.,[5] Punnett et al.,[6] and Henning et al.[7]). Others describe innovative approaches to

educational interventions, such as using lay educators to reach agricultural workers (Marin et al.[8]), secondary school teachers to reach working high school students (Shendell et al.[9]), occupational health specialists as public health collaborators (Davis et al.[10]), and unionized employees as leaders in addressing hazardous chemical exposures (Pechter et al.[11]). In all cases, the focus is on communities outside the traditional compass of most regulatory and public health agencies.

In most cases, the research studies are quasi- or nonexperimental in nature, reflecting the difficulties and costs inherent in conducting randomized, controlled trials. One study (Gong et al.[12]) describes the results of formative research methods as a precursor to an intervention study. Three studies describe different approaches to measuring the reach of an intervention (Pearson et al.,[13] Chapman et al.,[14] and Benavides et al.[15]). Some focus on the effectiveness of single types of interventions, such as engineering controls (Meeker et al.)[16] or educational programs (Chapman et al.,[14] Sokas et al.,[17] Vela Acosta et al.,[18] and Bush et al.[19]). Other articles describe multifaceted interventions that include engineering, behavioral, and administrative changes (Benavides et al.,[15] Parker et al.,[20] Thomas et al.,[21] Weinberg et al.,[22] and Stringer et al.[23]). Several studies describe interventions focused at multiple levels or at levels other than the traditional one of individual employees.[19,20,23] We believe this latter area is a particularly fruitful direction for future studies, given most employees' lack of resources and power to effect change.

There was great variety in the methods used to assess intervention outcomes. A number of investigators used quantitative measures to assess change; for example, injury rates,[15,23] airborne concentrations,[16] biomarkers,[13,21] work practices,[14,20,23] and program elements.[20] Others employed self-reports of symptoms[4] or knowledge, attitudes, and work practices.[12,17–19]

We are greatly encouraged by the number and variety of articles included in this supplement. Clearly, intervention research is on an upward trajectory. We encourage more investigators to consider undertaking such studies while continuing to pay careful attention to the steps necessary for demonstrating best practices in real-world settings.[4] Intervention research is the key to demonstrating that the field of occupational health and safety rests on an established set of principles that can be shown via scientific methods to lead to long-term improvements in worker protection. We are hopeful that NIOSH will continue to focus on and fund research in this area in the future.

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